

4. DESIGN STAGE

4.1. Overview. The Design stage transforms the detailed requirements of the Definition stage into a complete, detailed specification of the system. The analyses of this stage are performed within the framework of the system concept, converting the functional and data requirements of the Definition stage into a complete system design which will guide the work of the Development stage. Some of the most significant activities of this stage include:

- o Selecting any software packages which will be part of the system.
- o Designing the components of the system: data base structures, inputs, outputs, internal processing, manual procedures, system interfaces, technical environment, overall system architecture.
- o Developing procedures for conversion from existing systems/data bases to the new system/data base(s).
- o Conducting walkthroughs of the design to ensure that it is programmatically and technically complete.
- o Beginning development of approaches to user support and system maintenance after implementation.

The decisions of the Design stage reexamine in greater detail many of the parameters of the system concept addressed during the Concept phase, and the detailed requirements produced during the Definition stage. The decisions made in this stage address in detail how the system will meet the previously defined functional and data requirements. The system design prepared in this stage will be the basis for the activities of the Development stage.

Several points are of particular note for the Design stage:

- o For large systems, the activities of this phase may be conducted in an iterative fashion, producing first a general design that emphasizes the functional features of the system, and then a detailed design that expands the design by providing all the technical detail.
- o The specific timing and content of the walkthroughs are determined by the design methodologies and tools used during this stage.
- o In many cases, the data base used by a system is an integral part of the system and is included as part of the System Design. In other cases, a system may use a data base that is part of another system. In those

cases, the documentation of the data base design will not be contained in the System Design; it will be presented in the Physical Data Base Design and referenced in the System Design.

- o The Design Baseline is established at the end of this stage. It consists of the System Design document(s), the Physical Data Base Design, and the Design Data Dictionary.
- o If the system design identifies either changes in the identified information management problem, or the need for modifications in the system concept or detailed requirements, the products of the Initiation Baseline and/or Functional Baseline are updated to reflect these changes or modifications.

4.2. Detailed Description. A detailed description of the Design stage is presented in the following exhibits:

Exhibit 4-1	Design Stage Summary
Exhibit 4-2	Design Stage Objectives
Exhibit 4-3	Design Stage Decisions
Exhibit 4-4	Design Stage Activities
Exhibit 4-5	Design Stage Roles and Responsibilities
Exhibit 4-6	Product: System Design
Exhibit 4-7	Product: Design Decision Paper
Exhibit 4-8	Product: Physical Data Base Design
Exhibit 4-9	Product: Design Data Dictionary
Exhibit 4-10	Product: Project Management Plan
Exhibit 4-11	Product: Data Management Plan
Exhibit 4-12	Product: System Test Document
Exhibit 4-13	Product: Acceptance Test Document

The following products may also be updated during the Design stage:

<u>Product</u>	<u>Exhibit</u>
Initiation Baseline	
Initiation Decision Paper	1-6
System Concept	2-6
Definition Baseline	
Configuration Accounting Records	3-6
Detailed Functional Requirements	3-7
Detailed Data Requirements	3-8
Requirements Data Dictionary	3-10

Outlines of all products are presented in Appendix B.

A number of activities of the Design stage relate to specific topics that are addressed throughout the life cycle. A life cycle wide view of these topics is presented in Chapter 10 of this Guidance.

EXHIBIT 4-1: DESIGN STAGE SUMMARY

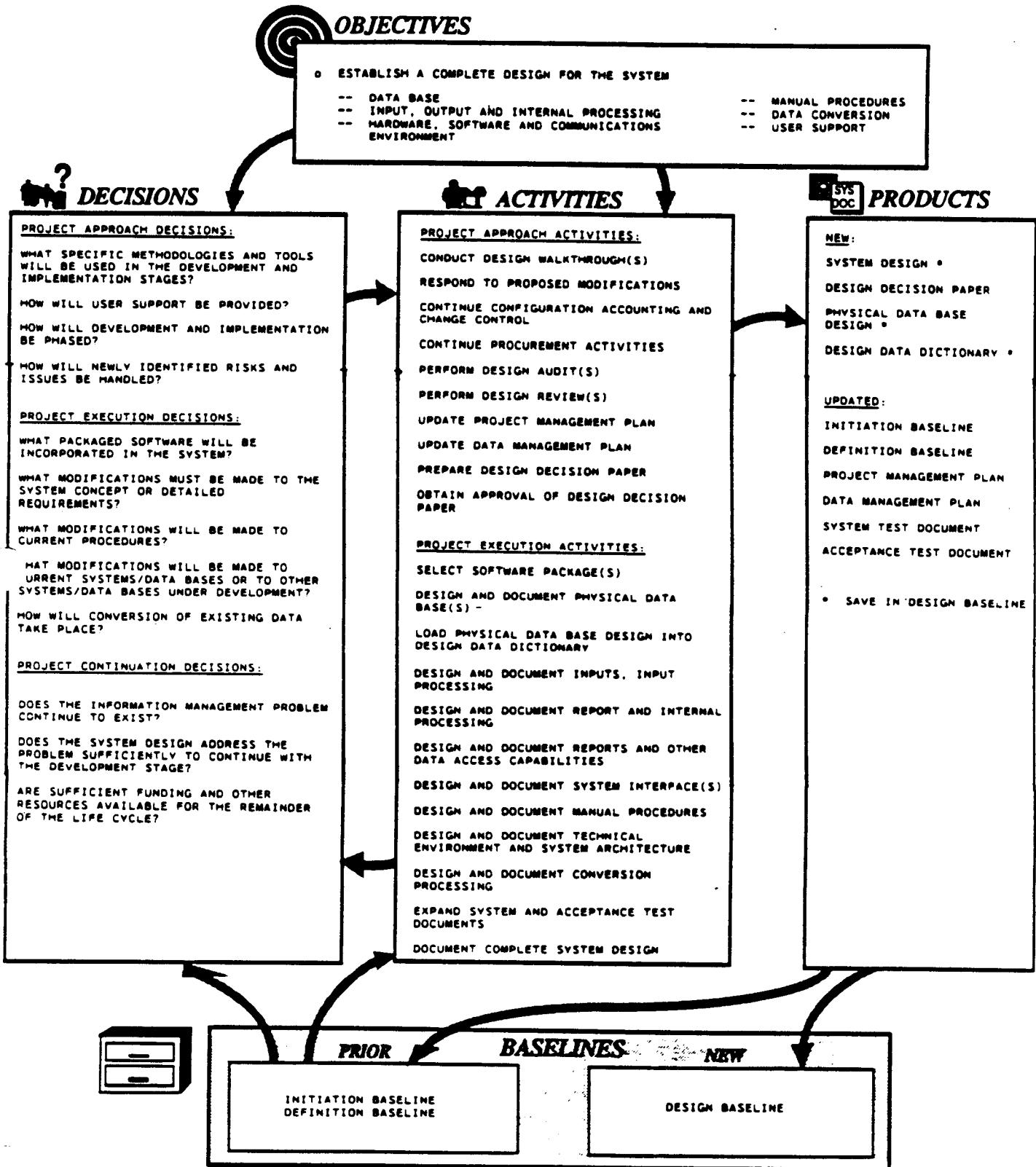




EXHIBIT 4-2: DESIGN STAGE OBJECTIVES

OBJECTIVE NAME

Establish a complete design for the system

OBJECTIVE DESCRIPTION

Expands the high-level design represented by the System Concept into a detailed specification of all features of the system, including physical data base; input, internal, and output processing; system interfaces; hardware, software and communications environment; manual procedures; data conversion; and user support.



EXHIBIT 4-3: DESIGN STAGE DECISIONS

DECISION NAME	DECISION DESCRIPTION
<u>Project Approach Decisions:</u>	
What specific methodologies and tools will be used in the Development and Implementation stages?	Determines the analytic and system development methods and tools to be used in the Development and Implementation stages. Includes consideration of prototyping methods, and the linkage of methods and tools across life cycle phases.
How will user support be provided?	Determines the extent of support required for users and other system support staff; methods, timing, and location of initial training; mechanisms for providing ongoing training and user support.
How will development and implementation be phased?	Confirms the phasing (if any) of the development and implementation of modules of the system, and determines the specific content of each phase, their timing, and linkages among phases.
How will newly identified risks and issues be handled?	Determines how to address new issues and risks identified during the design. Alternatives for each issue/risk include: reexamine and revise the System Concept, functional and data requirements, and design before continuing with development; or defer addressing them until after implementation, when any modifications may be treated as either changes or enhancements.



EXHIBIT 4-3: DESIGN STAGE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
What packaged software will be incorporated in the system?	Confirms any functions to be performed by commercial software packages, including data base management systems, and selects the specific package(s) that fulfill(s) the requirements of the system most cost-effectively. Determines any specific modifications that will be necessary.
What modifications must be made to the System Concept or detailed requirements?	If any new requirements have been identified during the Design stage, determines the modifications which must be made to the System Concept or detailed requirements to accommodate any newly identified constraints. Determines whether the information management problem has changed.
What modifications will be made to current procedures?	Determines those operations that will be affected by the new system, and the modifications that will be needed to take full advantage of the system: timing/frequency of activities, location where performed, revised workflow, etc.
What modifications will be made to current systems/data bases or to other systems/data bases under development?	Confirms the current and developmental systems and/or data bases that will interface or share resources with the new system, and determines specific modifications to these systems and/or data bases that will be required to accommodate the new system, such as: new modules, revised processing logic or data structures, hardware resource allocation, communications access, security, etc.
How will conversion of existing data take place?	Confirms the existing data bases and files containing data that will be used by the new system, and determines the methods and tools to be used to accomplish conversion.



EXHIBIT 4-3: DESIGN STAGE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
Does the information management problem continue to exist?	Confirms that the defined information management problem continues to exist, or that it has changed so significantly from the problem addressed by the system design that a major redirection of the system may be needed.
Does the system design address the problem sufficiently to continue with the Development stage?	Confirms that the system design adequately addresses the problem, and that appropriate approvals have been secured for the system to continue with the Development stage.
Are sufficient funding and other resources available for the remainder of the life cycle?	Confirms that the funding, personnel, and other resources needed to support the system through the rest of the life cycle are available.



EXHIBIT 4-4: DESIGN STAGE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
Project Approach Activities:		
Conduct design walkthrough(s)	Conduct one or more formal structured reviews of all aspects of the system to ensure that the details of the design are complete, meet the requirements for the system, and can be fully implemented as designed. (For large systems, two iterations of reviews, for a general design and then a detailed design, may be appropriate.)	System Design Configuration Accounting Records
Respond to proposed modifications	Assess proposed modifications to the requirements to assure that they solve the information management problem, and note potential impacts on the System Concept and/or System Design. Determine whether elements of the system design deviate significantly from the System Concept and warrant a modification of the concept.	Configuration Accounting Records
Continue configuration accounting and change control	Denote configuration items with respect to all elements of the system design and physical data base design. Maintain records of suggested modifications to System Concept, functional requirements, or data requirements, and their disposition.	Configuration Accounting Records
Continue procurement activities	Continue those tasks needed to acquire needed resources (e.g., hardware, software, communications, services) to develop, implement, and operate the system.	--



EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
project Approach Activities (Continued):		
Perform design audit(s)	<p>Examine the System Design and Project Management Plan to confirm that all required content has been provided. Compare these documents with the configuration accounting records to ensure that all suggested modifications to the functional requirements, data requirements, or design elements of the System Concept are clearly documented. Multiple audits may be necessary if major rework of the system design document takes place prior to final review and approval.</p>	<p>System Design Project Management Plan Configuration Accounting Records</p>
Perform design review(s)	<p>Confirm that the information management problem continues to exist, and that the requirements are unchanged. Conduct a formal review the System Design document and Data Dictionary to ensure that the system as designed will fulfill the functional and data requirements adequately, at reasonable cost, in a responsive timeframe, and at acceptable risk. Note and confirm the recommendation of any major modifications to the information management problem, System Concept, and/or functional or data requirements for the system. Revise all documents as appropriate.</p>	<p>System Design Initiation Decision Paper System Concept Detailed Functional Requirements Detailed Data Requirements</p>



EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
Project Approach Activities (Continued):		
Update Project Management Plan	<p>Update benefit-cost analysis. Describe affected organizational relationships. Develop workplan for Development stage, and preliminary approaches for conversion, implementation, post-implementation support, operation, maintenance.</p> <p>Summarize security and user support approaches as prepared during design effort. Update threshold analysis of reviews and approvals.</p> <p>Select methodologies and tools to be used in the Development, Implementation, and Production stages, referencing applicable standards.</p> <p>Describe any phasing of development and implementation. Specify interim reviews to be performed during the Development stage.</p>	Project Management Plan
Update Data Management Plan	<p>Describe choice of data base management software. Develop testing support plans and data conversion plan.</p>	Data Management Plan
Prepare Design Decision Paper	<p>Summarize the results of all other project approach and execution activities conducted in the Definition stage. Include results of threshold analysis to confirm levels of review and approval.</p>	Design Decision Paper
Obtain approval of Design Decision Paper	<p>Obtain program management approval to continue with the Development stage, and confirm the continued commitment and availability of funding and other resources for the remainder of the system life cycle.</p>	Design Decision Paper



EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
Project Execution Activities:		
Select software package(s)	Determine which available commercial software package(s), including data base management systems, will meet the system requirements most cost-effectively, and take needed actions to acquire the package. (A specific package may have been selected in the Concept Phase, in response to constraints on OSWER's system environment.)	System Design
Design and document physical data base(s)	Transform the logical data model to fit the structure of the data base management system. Modify the resulting physical model, if necessary, to accommodate volume/response requirements or distribution of data base(s) to multiple locations.	Physical Data Base Design
Load physical data base design into Design Data Dictionary	Create the Design Data Dictionary by expanding the Requirements Data Dictionary. Enter metadata into the Design Data Dictionary documenting the physical design of each data base or data file. If the system design uses a different dictionary software package, copy data element definitions from the Requirements Data dictionary.	Design Data Dictionary
Design and document inputs, input processing	Prepare detailed specifications of all inputs to the system, including media, format, edit/validation criteria, and update processing.	System Design
Design and document report and internal processing	Prepare detailed specifications of all report and internal processing.	System Design



EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
<u>Project Execution Activities (Continued):</u>		
Design and document reports and other data access capabilities	Prepare detailed specifications for reports and other data access capabilities, including user selection procedures, content, media, format (including graphics as well as tabular reports), and processing mode (e.g., batch, on-line).	System Design
Design and document system interface(s)	Prepare detailed specifications for the interface(s) with existing and planned systems that will share data or resources with this system. Include specification of new modules, revised processing logic or data structures, hardware resource allocation, communications access, security, etc. (Note: Modifications to other systems should be planned and managed as part of the life cycle for the corresponding systems.)	System Design
Design and document manual procedures	Prepare detailed description of the non-automated procedures of the system and how the users will perform them.	System Design
Design and document technical environment and system architecture	Confirm the technical components of the system (ADP equipment, data communications, system software, and application software), and describe in detail the relationships among them and their geographic distribution.	System Design



EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
<u>Project Execution Activities (Continued):</u>		
Design and document conversion processing	Prepare detailed description and specifications of the data to be loaded from existing automated and manual system(s) into the new system. Addresses logical mapping of records from the old system(s) into new system; software to perform data edit, validation, and data base initialization; and procedures for handling errors.	System Design
Expand system and acceptance test documents	Prepare detailed description of system and acceptance test procedures, and initiate preparation of test data. Incorporate results of Data Administration planning.	System Test Document Acceptance Test Document
Show complete System Design	Prepare a comprehensive description of the overall design of the system, summarizing the products of the preceding project execution activities.	System Design

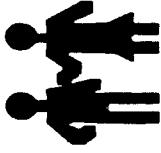


EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES

ROLES AND RESPONSIBILITIES					
<u>ACTIONS</u>	<u>OWNER PROGRAM MANAGEMENT</u>	<u>OWNER PROGRAM STAFF</u>	<u>PROJECT MANAGEMENT</u>	<u>PROJECT STAFF</u>	<u>QUALITY ASSURANCE</u>
CONDUCT DESIGN WALKTHROUGH(S)		PERFORM	LEAD	PERFORM	REVIEW
RESPOND TO PROPOSED MODIFICATIONS	APPROVE	SUPPORT	LEAD	PERFORM	REVIEW
CONTINUE CONFIGURATION ACCOUNTING AND CHANGE CONTROL			LEAD	PERFORM	REVIEW
CONTINUE PROCUREMENT ACTIVITIES			LEAD	PERFORM	SUPPORT
PERFORM DESIGN AUDIT(S)		SUPPORT	LEAD	PERFORM	SUPPORT
PERFORM DESIGN REVIEW(S)		PERFORM	LEAD	SUPPORT	PERFORM
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/PERFORM	SUPPORT	REVIEW
UPDATE DATA MANAGEMENT PLAN		SUPPORT	LEAD/PERFORM	SUPPORT	REVIEW
PREPARE DESIGN DECISION PAPER		SUPPORT	LEAD/PERFORM	SUPPORT	REVIEW
OBTAIN APPROVAL OF DESIGN DECISION PAPER	APPROVE	SUPPORT	LEAD/PERFORM	SUPPORT	

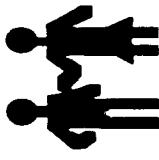


EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)					
<u>ACTIONS</u>	<u>OWNER PROGRAM MANAGEMENT</u>	<u>OWNER PROGRAM STAFF</u>	<u>PROJECT MANAGEMENT</u>	<u>PROJECT STAFF</u>	<u>QUALITY ASSURANCE</u>
		SUPPORT	LEAD	PERFORM	REVIEW
SELECT SOFTWARE PACKAGE(S)					
DESIGN AND DOCUMENT PHYSICAL DATA BASE(S)			LEAD	PERFORM	REVIEW
LOAD PHYSICAL DATA BASE DESIGN INTO DESIGN DATA DICTIONARY			LEAD	PERFORM	REVIEW
DESIGN AND DOCUMENT INPUTS, INPUT PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW
DESIGN AND DOCUMENT REPORT AND INTERNAL PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW
DESIGN AND DOCUMENT REPORTS AND OTHER DATA ACCESS CAPABILITIES		SUPPORT	LEAD	PERFORM	REVIEW
DESIGN AND DOCUMENT SYSTEM INTERFACE(S)		SUPPORT	LEAD	PERFORM	REVIEW
DESIGN AND DOCUMENT MANUAL PROCEDURES		SUPPORT	LEAD	PERFORM	REVIEW

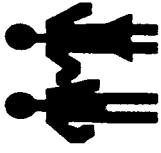


EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)					
ACTIONS	OWNER PROGRAM <u>MANAGEMENT</u>	OWNER PROGRAM <u>STAFF</u>	PROJECT <u>MANAGEMENT</u>	PROJECT <u>STAFF</u>	QUALITY <u>ASSURANCE</u>
DESIGN AND DOCUMENT TECHNICAL ENVIRONMENT AND SYSTEM ARCHITECTURE			LEAD	PERFORM	REVIEW
DESIGN AND DOCUMENT CONVERSION PROCESSING	SUPPORT		LEAD	PERFORM	REVIEW
EXPAND SYSTEM AND ACCEPTANCE TEST DOCUMENTS	SUPPORT		LEAD	PERFORM	REVIEW
DOCUMENT COMPLETE SYSTEM DESIGN	SUPPORT		LEAD	PERFORM	REVIEW
					SUPPORT

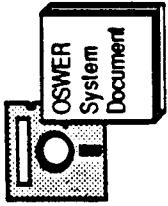


EXHIBIT 4-6: SYSTEM DESIGN

SUMMARY DESCRIPTION

The System Design document provides a complete description of the design of the system, including all aspects of the system. It expands on the design embodied in the System Concept to fulfill the detailed functional and data requirements, addressing data, input and output processing, interfaces with other systems, hardware, software, communications, manual procedures, and data conversion. For large systems, the design may evolve through two iterations, general and detailed design, which are reflected in the preparation of two system design documents. Both provide comprehensive views of the system, with the **Detailed System Design** document providing the greater level of detail. To facilitate configuration management, the features of the design should be summarized in a table that identifies a configuration item for each component of the system.

TOPICS

- Introduction
 - Purpose of this document
 - References to related documents
- System Design overview
 - Summary of system functions
 - System modules, and data flows through the system
 - Interfaces with other systems
 - Organizations responsible for maintaining interfaces with other systems
 - System architecture (hardware, software, communications)
- Life cycle strategy
 - Phasing of development/implementation of system modules
 - Organization responsibilities for ongoing development and future maintenance of system
- Physical data structure
 - Reference Physical Data Base Design

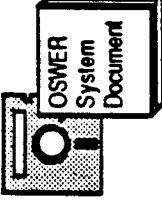


EXHIBIT 4-6: SYSTEM DESIGN (Continued)

- o System module design/specifications (for each module; includes identification of, and processing performed by, commercial software packages)
 - Details of data flows through the module
 - Inputs and input/update processing
 - Outputs (reports, graphics, query capabilities)
 - Internal processing
 - Interfaces to other systems
- o User procedures
 - Identification of manual operations
 - Process descriptions
 - Interface with automated modules of system
- o Conversion processing
 - Existing system(s) identification
- o Functions to be converted
 - Records to be converted (type, volume)
 - Edit/validation processing
 - Timing of conversion/parallel operations
 - Staff support required/organizational impact
- o Technical environment and system architecture
 - Hardware
 - Software
 - Communications
- o Security and control
 - Summary of security features (specific features are specified in detail in prior sections of the document)
- o Personnel required

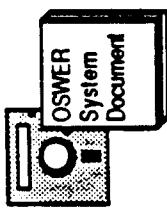


EXHIBIT 4-7: DESIGN DECISION PAPER

SUMMARY DESCRIPTION

The Design Decision Paper serves as a decision document, for presentation to OSWER program management in support of the identified system design solving the information management problem. It provides a summary of the key analyses of the Design stage, emphasizing those aspects of the system design that are important to program management, including significant revisions to the Functional Requirements or Data Requirements, or to the high level design of the system presented in the System Concept and the Definition Decision Paper. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Development stage.

TOPICS

- Introduction
 - Purpose of this Design Decision Paper
 - References to related documents
- Requirements confirmation
 - Confirm Initiation Decision Paper
 - Still valid
 - New functional requirements (if any)
 - New data requirements (if any)
- Update of threshold analysis of reviews and approvals
 - Summary of findings
 - Recommendations
- Summary of System Design
 - Results of Design review (note any incomplete reviews)

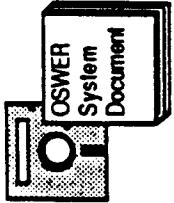


EXHIBIT 4-7: DESIGN DECISION PAPER (Continued)

- o Issues
 - Actions on prior issues
 - New or outstanding issues, and proposed solutions
 - Risks or issues that have been deferred for future resolution
- o Summary of workplan and next steps
- o Summary of decisions needed
 - Request confirmation of associated resources/funding
 - Request approval to continue with Development stage

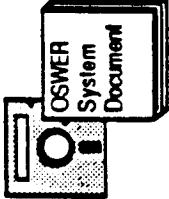


EXHIBIT 4-8:

PHYSICAL DATA BASE DESIGN

SUMMARY DESCRIPTION

During Design, the designer transforms the logical data model into a design for physical structures supportable by the data management software to be used. Changes to the structure of the logical data model should be minimized. Generally, changes to the structure of the logical data model should only occur due to performance requirements of the system being built, or the physical structure of the data management software being used. The design is entered into the design data dictionary. For data base(s) used by a single system, the Physical Data Base Design may be included in the System Design.

TOPICS

- | | |
|---|--|
| <ul style="list-style-type: none">o Introduction<ul style="list-style-type: none">-- Purpose of this documento Description of the data management software<ul style="list-style-type: none">-- Physical model-- Data definition language-- Data manipulation language(s)-- Access methods-- Data types supported-- Role of Data Dictionaryo Narrative description of the data base<ul style="list-style-type: none">-- Systems supportedo Schematic of the Physical Data Base Design<ul style="list-style-type: none">-- Details of the Physical Data Base Design structure (include definitions) | <ul style="list-style-type: none">o Listing of data base definition input statements<ul style="list-style-type: none">-- Data structures-- Data fields-- Keyso Technical information (specific content is tailored to reflect the data management software selected for the system)<ul style="list-style-type: none">-- Block sizes-- Physical size limits-- Free space-- Pointers-- Data set allocation-- Use of inverted keys (if applicable)-- Redundancy control-- Sorting |
|---|--|

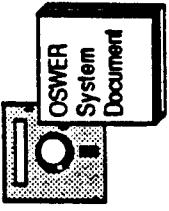


EXHIBIT 4-8: PHYSICAL DATA BASE DESIGN (Continued)

- o Explanation of trade-offs during design
- o Data base programming guidelines
 - Common return code checking routines
 - Use of checkpoints
 - On-line
 - Batch
- o Restart standards/guidelines
 - Operating system restart
 - DBMS automatic restart
 - Program restart coding
- o Repositioning non-data base sets to checkpoints
 - Obtaining restart data
- o Backup and logging required
 - Data base backup
 - Audit trail for updates to data base
- o Responsible designer
- o Data Administrator's review comments
 - Comments on significant issues provided by OSWER Data Administrator

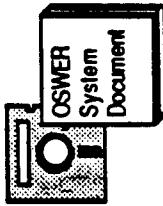


EXHIBIT 4-9: DESIGN DATA DICTIONARY

SUMMARY DESCRIPTION

The Design Data Dictionary expands on the metadata stored in the Requirements Data Dictionary. It contains descriptions of the physical data base structures and the manner in which they are implemented in the test versions of the data base(s). This product can be stored electronically in a data dictionary system.

TOPICS

- o For each data entity and data element:
 - Name
 - Programmatic definition
 - Purpose
 - Data steward
 - Data definer
 - Source
- o Data custodian(s)
- o Data structures
 - Data base(s)
 - Data sets (files)
 - Segments
 - Records
 - Keys
 - o Physical structures
 - Block sizes
 - Data set allocations
 - Physical size limits

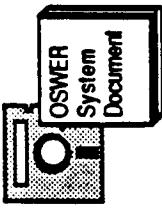


EXHIBIT 4-10: PROJECT MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Project Management Plan is updated and refined throughout the Design stage to reflect the project team's evolving management approach. At the end of this stage, the Project Management Plan covers a broad range of topics, as evidenced in the topical outline below. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Project Management Plan for the first time during this phase; other material was initially developed during earlier stages, and is refined as appropriate during Design.

TOPICS

- o Project charter/objectives
 - Project identification (incorporate Initiation Decision Paper by reference)
 - Mission and objectives
 - Scope of information management problem/project
- o Life cycle adjustment
 - Consolidation of phases and stages, if any
 - Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
 - Project management structure
 - Manager assigned: individual, current organization, authority Boards, committees, or other project management participants
 - Project team organization
 - Structure and roles
 - Participating organizations
 - Staffing plan (including internal staff and use of contractors)

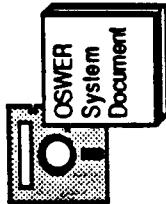


EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Project budget (broken out by stage)
 - EPA staff
 - Contractor services
 - Equipment acquisition
 - Hardware maintenance
 - Site preparation
 - Packaged software acquisition
 - Supplies
 - Timeshare
 - Other
 - Cost-accounting methodology
- o Project reviews/quality assurance
 - Applicable project review level
 - Reviews to be conducted (by stage)
 - Organization/individuals for each review
 - Review schedule
- o Applicable project approvals
 - Project approval level
 - Specific approvals to be obtained (by stage)
 - Approval organization and individuals
 - Approval schedule
- o Benefit-cost analysis (summary, transferred from other life cycle products)
 - Methodology and assumptions
 - Benefits
 - Programmatic
 - Annual monetary
 - System life
 - Costs
 - Non-recurring
 - Recurring
 - Annual
 - System life
 - Payback period
 - Sensitivity analysis
 - Methodologies and tools
 - Methodologies (non-automated)
 - For Concept phase
 - For Definition stage
 - For Design stage
 - For Development stage
 - For Implementation stage
 - Impact on other stages
 - Automated tools/software packages
 - For Concept phase
 - For Definition stage
 - For Design stage
 - For Development stage
 - For Implementation stage
 - Impact on other stages
 - Support required (if any) for use of tools

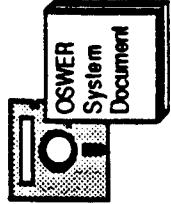


EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Workplan
 - Concept phase
 - Definition stage
 - Design stage
 - Development stage
 - Activities and related tasks
 - Products
 - Schedule by task and product
 - Staff and contractor assignments
 - Level of resources for each task and/or product
 - Task relationships/dependencies
 - Schedule of reviews and approval
 - Performance/progress reporting
 - Notification
- o Procurement approach
 - Resources to be acquired through existing contracts
 - OSWER contracts
 - Other agency contracts
 - Resources to be acquired through new procurements
 - OSWER vehicles
 - Other Agency vehicles
 - Schedule for each procurement
 - Workplan for each OSWER procurement
 - Procurement assistance individuals for each procurement
- o Configuration Management Plan
 - Configuration manager (organization and individual)
 - Change Control Panel
 - Participants (organizations and individuals)
 - Modification request/approval process
 - Procedures/methods for configuration identification and accounting, software control, audits
 - Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents
- o Documentation standards: Standards to be used for each life cycle product
 - Security approach
 - Summary of security requirements (reference other life cycle products)
 - Security organization (if applicable)
 - Hardware and facilities measures
 - Software and communications measures
 - Data base security
 - Procedural measures
 - Backup and recovery

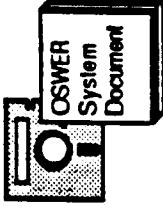


EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Conversion approach
 - Dates and times, by module and location
 - Special conditions
 - Personnel to accomplish installation, and/or on call
- o User support approach
 - Training activities
 - Materials to be prepared
 - Sessions, schedules, and participants
 - Ongoing user support (hotline, etc.)
- o Maintenance approach
 - Maintenance support organization
 - Release management procedures
- o Installation approach: Schedule for installing each separately-installed system module
 - Operation approach
 - Organization of operation support activities

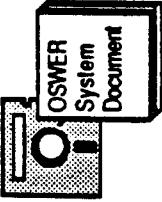


EXHIBIT 4-11: DATA MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Data Management Plan reflects the project's data management approach. As the project progresses through the life cycle, additional information is added to this plan, and existing information is modified to reflect the current approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Data Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Design.

TOPICS

- o Information need
 - Document the information need
 - Missions supported
 - Scope of the need
- o Data steward organizations
 - Lead organization responsibilities
 - Other organizations' roles
 - Data definers for the project
- o Concept phase
 - Entity list
 - Entity definitions
 - Entity identifiers
 - Conceptual data model
 - Likely sources of data
 - Information flow/data model validation
- o Definition stage
 - Data distribution plan
 - Information collection burden
- o Interview plans
 - Data analysis by process
 - Entity normalization
 - Conceptual data model revision
 - High-level data requirements revision
 - Logical data model
 - Requirements Data Dictionary
 - Data flow/logical model validation
- o Design stage
 - Logical data model revision
 - Physical data base design
 - Design Data Dictionary

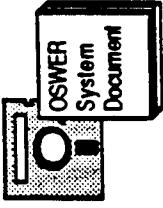


EXHIBIT 4-11: DATA MANAGEMENT PLAN (Continued)

- o Data documentation responsibilities
 - Creating data documentation
 - Maintaining existing data documentation
- o Data quality assurance plan
 - Responsible organization
 - Milestones and staffing
 - Data quality objective monitoring plan
- o Data security requirements and strategy
 - Sensitive data
- o Data life cycle methodologies and tools
 - Metadata management approach
 - Development & Installation phase
 - Data management software
 - Operation phase
- o Data conversion strategy
 - Data conversion plan
 - Sources
 - Media
 - Load programs required
 - Schedule and staffing
 - Validation
 - Plan for physical flow of data
 - Data testing strategy
 - Testing support
 - Kinds of test data bases required
 - Test data provision
 - Performance validation plan
 - Responsible organization
 - Projected testing support needed

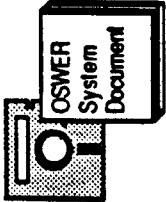


EXHIBIT 4-12: SYSTEM TEST DOCUMENT

SUMMARY DESCRIPTION

The System Test Document is updated during the Design stage by the addition of test procedures and test data descriptions. It expands on the previously documented testing strategy and testing criteria to describe in detail how the system will be tested internally by the project team during Development and subsequent stages. Underlined items are added to the System Test Document for the first time during this stage; other material was initially developed during Concept or Definition, and is refined as appropriate during Design.

TOPICS

- o Introduction
 - Purpose of this document
 - References to related documents
- o Testing strategy
- o Test criteria
- o Test plan
 - System test plan overview
- Internal testing
 - Procedures
 - Test data descriptions (description of test data and its source(s))
- Unit testing
 - Procedures
 - Test data descriptions (description of test data and its source(s))
- Integration testing
 - Procedures
 - Test data descriptions (description of test data and its source(s))
- System testing
 - Procedures
 - Test data descriptions (description of test data and its source(s))

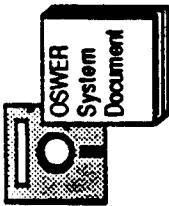


EXHIBIT 4-13: ACCEPTANCE TEST DOCUMENT

SUMMARY DESCRIPTION

The Acceptance Test Document is updated during the Design stage by the addition of test procedures and test data descriptions. It expands on the previously documented testing strategy to describe how acceptance testing will take place with regard to each of the test scenarios defined during the Definition stage. Underlined items are added to the Acceptance Test Document for the first time during this stage; other material was initially developed during Concept or Definition, and is refined as appropriate during Design.

TOPICS

- o Introduction
 - Purpose of this document
 - References to related documents
- o Testing strategy
 - Participating organizations
 - Relationship to testing of other systems (if applicable)
 - Approximate schedule
 - Issues to be resolved
- o Test requirements/scenarios: description of representative events or cases that should serve as the basis for testing the system against the detailed Functional and Data Requirements
- o Test plan (addresses the following for each scenario):
 - Test procedure
 - Test data descriptions (description of test data and its source(s))